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SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
SCHOOL OF CIVIL ENGINEERING
B.Tech. (Second Year, III[rd] Semester) Major Examination (Odd) 2019-20

Entry No: | | | | | | | | | |

Date: 12-12-2019

Total Number of Pages: [02]

Total Number of Questions: [08]

Course Title: Fluid Mechanics – I

Course Code: CEL 2041

Time Allowed: 3 Hours **Max Marks: [50]**

Instructions / NOTE

i. Attempt All Questions
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate
iii. Assume an appropriate data / information, wherever necessary / missing

	Section - A	Marks	CO No.
Q1	Define the following		
	a) Real fluid	[01]	CO1
	b) Kinematic viscosity of fluid with SI unit	[01]	CO1
	c) Rate of flow of fluid with SI unit	[01]	CO1
	d) Vapour pressure of fluid	[01]	CO1
Q2	a) Explain in detail Hydrodynamically smooth and rough boundaries with the help of neat sketch. Also write down ranges for smooth and rough boundaries with the help of Reynolds number.	[03]	CO2
	b) Prove that actual velocity at any point in pitot tube is equal to $V_{actual} = C_v (2gh)^{1/2}$ with the help of Bernoulli's theorem. Also draw neat sketch of pitot tube.	[03]	CO2
Q3	a) The orifice of diameter 100 mm is connected to bottom of tank having head of water over an orifice is 10 m. The water flowing through orifice is collected in circular tank of diameter 1.5 m. The rise of water level in collection tank is 1 m in 25 seconds. Find the co-efficient of discharge of an orifice	[03]	CO3
	b) Explain in detail the function of piezometer and simple U tube manometer used for calculating gauge pressure with the help of neat sketch	[03]	CO3
Q4	Write a short note on venturimeter with the help of neat sketch (2 marks) A venturimeter having throat diameter 10 cm is connected to horizontal pipe of diameter 200 mm. The discharge of oil having specific gravity 0.8 through venturimeter is 60 liters/second. Find the reading of oil-mercury U tube differential manometer. Also show the arrangement of venturimeter and U tube differential manometer with the help of neat diagram. Take C_d = 0.98 (4 marks)	[06]	CO4

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	Section - B		
Q5	Write a short note on capillarity phenomenon for fluid (2 marks) Calculate the capillary rise or fall in small glass tube having diameter 2.5 mm when immersed vertically in 1) Water and 2) Mercury. The surface tension for water and mercury in contact with air is 0.0725 N/m and 0.52 N/m respectively. The angle of contact for mercury and glass tube is 130°. Draw the neat sketch for both cases 1 and 2 (4 marks)	[06]	CO3
Q6	Explain in detail buoyancy and centre of buoyancy of body fully immersed in fluid with the help of sketch (2 marks) A metallic body having width and height 1.5 m and 1.0 m respectively. The length of body is 2 m and its weight in water is 1962 N. Find the weight and mass of body in air. Also find out the specific gravity of body (4 marks)	[06]	CO2
Q7	Explain in detail one, two and three dimensional flows of fluid (2 marks) Also derive the continuity equation in three dimensions in Cartesian Co-ordinates system with the help of neat sketch (4 marks)	[06]	CO4
Q8	Explain Bernoulli's theorem and assumptions for Bernoulli's theorem. (2 marks) Prove that the total energy at any point of fluid is constant for ideal fluid using Eular's equation of motion (3 marks) The oil of specific gravity 0.95 and kinematic viscosity 15 stoke at 20° C is flowing through tapper pipe of length 100 m having diameter 400 mm at upper end 200 mm at lower end. The rate flow of oil through pipe is 80 liters/second. The pipe has slope of 1 in 20. If the pressure at higher end is 20 N/cm^2 then find the pressure at lower end and direction of flow of oil. Draw the sketch of pipe indicating direction of flow (5 marks)	[10]	CO3, CO4

Course Outcomes

CO1. Understand the basic terms used in fluid mechanics
CO2. Understand the broad principles of fluid statics, kinematics and dynamics
CO3. Understand classifications of fluid flow
CO4. Define the concepts related to boundary layer theory and drag and lift forces

CO	Questions Mapping	Total Marks	Total Number of Students (to be appeared in Exam)
CO1	Q1 (a), (b), (c) and (d)	4	60
CO2	Q2 (a), Q2 (b) and Q6	12	60
CO3	Q3 (a), Q3 (b), Q5 and Q8	16	60
CO4	Q4, Q7 and Q8	18	60